Florida's hurricane lessons could save homes, lives in tornado-prone areas

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Scientists combing through the destruction left behind by the massive twister that swept through Tuscaloosa, Ala., last month say beefing up building codes and retrofitting existing homes with building techniques honed in hurricane-battered Florida could save property and lives in tornado-prone areas throughout the country.

“Since Hurricane Andrew struck Florida back in 1992, Florida’s building construction professionals and building officials have continually improved their structural load paths, which means that connections between the roof and wall framing and between wall to foundations have been strengthened,” said David O. Prevatt, an assistant professor of civil and coastal engineering at the University of Florida and principal investigator of the project. “In contrast, older homes in Tuscaloosa had mainly toe-nailed rafter connections, and almost none had adequate foundation anchors.”

The project is being funded by a National Science Foundation RAPID Response Grant for Exploratory Research to investigate and gather data about wind damage to, and performance of, wood-frame structures in the affected areas.

Prevatt acknowledged that there is no defense against the most devastating tornado winds, which can top 200 mph, but he said he believes improvements in home construction can make houses and apartment buildings safer in less-severe tornado conditions.

“There is no magic bullet here. An EF4 or EF5 level wind will still level even the best-constructed homes in its path,” Prevatt said. “The challenge facing us is to somehow improve performance of our existing homes so that more of them can survive the less intense EF0 to EF2 tornado and by so doing better protect its occupants.”

The NSF recognized the urgency with the grant request because this type of data on structural failures is perishable; once debris removal begins, there is no way to analyze the performance of the wood structures, said John W. van de Lindt, a professor of civil, construction and environmental engineering at the University of Alabama. The grant is being provided to UF to work in close collaboration with UA and other researchers.

The research team inspected the 5.9-mile affected tornado path in Tuscaloosa on May 2-5 to analyze wood-frame structures that were not damaged by trees. The team received clearance from FEMA’s Engineering Division and inspected 150 structures, including single-family homes (one- and two-story) and apartment complexes. Collecting more than 3,000 photos, the team determined the EF-Scale rating in relation to damage for each of the 150 structures, with values ranging from EF0 to EF5, depending on the location within Tuscaloosa.

Based on that data, Prevatt said, states that experience frequent tornado activity would be well-advised to beef up their building codes to more closely resemble those in the Sunshine State. However, he said, even more lives and property could be saved by encouraging homeowners to retrofit their houses to be more wind-resistant.

“Retrofitting is a costly business but the opportunities might exist immediately after a disaster to build back something that will perform better than what was lost. This requires effort to go above and beyond the minimum current requirements of the building code,” Prevatt said.

“But realistically what price are you willing to pay for your family’s safety? “

Other team members include:

• Andrew Graettinger, associate professor of structural engineering and materials, and David Grau, assistant professor of construction engineering and management, both at The University of Alabama
• William L. Colbourne, director of wind and flood hazard mitigation, Applied Technology Council
• Rakesh Gupta, professor of wood science and engineering, Oregon State University
• Shiling Pei, assistant professor of civil and environmental engineering, South Dakota State University
• Samuel Hensen, branch engineering and technical manager, Simpson Strong-Tie Co.

The team will continue working with the National Science Foundation grant and the International Residential Code to begin the process of making changes to ensure load paths are enhanced to better protect the life safety of the occupants. The research team also will be available for the city of Tuscaloosa and surrounding areas as the rebuilding process begins.

Provided by University of Florida